

The invention relates to a digital versatile disc (DVD) player for replaying data streams in a DVD having stored such multiple data streams according to the MPEG as: a plurality of video data streams comprising a first video data stream, a second video data stream, etc.; one or a plurality of audio data streams; and one or a plurality of sub data streams comprising a caption.

The first and second video data streams are those of a first and a second cameras shooting a baseball game, for example, from two different angles. The DVD player in this publication has an angle alteration function for switching the first video data stream being replayed to the second video data stream.

Figure 1 shows the volume structure of a DVD-VIDEO disc replayed by the DVD player;

Fig. 2 the structures of a video manager (VMG) and a video title set (VTS) in the said volume structure;

Fig. 3 the details of the video object sets (VOBSs) shown in Fig. 2;

Fig. 4 a contiguous block (CYGB) indicating a state in which the video objects (VOBs) in a VOBS are disposed continuously;

Fig. 5 an interleaved block (ILVU) indicating VOBs in a VOBS disposed interleaved;

Fig. 6 the details of the navigation pack (NV\_PCK) shown in Fig. 3;

Fig. 7 the details of the content of the presentation control information (PCI) data shown in Fig. 6;

Fig. 8 the details of the content of the PCI general information packet (PCI\_GI) shown in Fig. 7;

Fig. 9 an angle alteration by the angle information for non-seamless (NSML\_AGLI) shown in Fig. 7;

Fig. 10 the details of the content of the data search information (DSI) data shown in Fig. 6;

Fig. 11 the details of the content of the DSI general information (DSI\_GI) shown in Fig. 10;

Fig. 12 the addresses pointed by the end address of the first reference picture in a video object unit (VOBU\_1STREF\_EA), VOB\_2NDREF\_EA and VOB\_3RDREF\_EA shown in Fig. 11;

Fig. 13 the seamless playback information (SML\_PBI) shown in Fig. 10;

Fig. 14 an angle alteration by the angle information for seamless (SML\_AGLI);

Fig. 15 the details of a program chain structure in the DVD-VIDEO disc;

Fig. 16 the program chain information shown in Fig. 15;

Fig. 17 the program chain general information (PGC\_GI) shown in Fig. 16;

Fig. 18 the cell playback information table (C\_PBIT) shown in Fig. 16;

Fig. 19 cell playback information (C\_PBI) stored in C\_PBIT.

To add with regard to Fig. 11, the end address of the first reference

picture in VOB (VOBU\_1STREF\_EA) has stored therein the address of a MPEG I picture; the end address of the second reference picture in VOB (VOBU\_2NDREF\_EA) the address of a MPEG P picture, and the end address of the third reference picture in VOB (VOBU\_3RDREF\_EA) the address of a MPEG P picture (Fig. 12).

The DVD player according to this publication is capable of making the angle alterations indicated in Figs. 9 and 14.

The non-seamless angle alteration indicated in Fig. 9 is to resume the starting point (address) of VOB #2 when an angle alteration command is issued by the user during the playback of a video object of the VOB #2 and replay a video object of a different angle from that starting point.

The seamless angle alteration indicated in Fig. 14 is to replay a video object of the angle prior to switching till the end of the ILBU #3 when an angle switching command is issued by the user during the playback of a video object of ILBU #3 and, thereafter (subsequent to the starting address of the ILBU #4), replay a video object of a different angle.

Sections 0045 to 0048 of the specification describe the following:

(1) The controller 11 of Fig. 21, when in receipt of an angle alteration command during a pause (a temporary stoppage of playback) by the DVD player, first stores in the memory 13 the cell elapse time (C\_ELTM) of the VOB including the currently displayed picture.

(2) The controller 11 then determines the current cell number (CN) and obtains from the cell playback information table (C\_PBIT) relating to the cell of that cell number the VOB start address (VOBU\_SA) of the foremost VOB in the cell of that cell number. The obtained VOB\_SA is made the current VOB\_SA.

(3) By utilizing the acquired "current VOB\_SA" and C\_ELTM stored in the memory 13, in order to display a picture of an angle different from the angle of the picture currently displayed, the playback starting address of the picture of the different angle is sought. To that end, the controller 11 makes a time code search in the cell. In the course of the search, the following five processes are made.

(3-1) Obtain the navigation pack (NV\_PCK) at the current VOB\_SA

(3-2) Seek the difference between C\_ELTM in the obtained NV\_PCK and the current C\_ELTM stored in the memory 13 and obtain a VOB\_SA nearest the difference from the VOB unit search information (VOBU\_SRI) of the NV\_PCK

(3-3) Determine whether the VOB\_SA obtained in process (3-2) above coincides with the current VOB\_SA obtained in process (3-1)

(3-4) In case the determination in process (3-3) is negative, the VOB\_SA obtained in process (3-2) is made the current VOB\_SA in place of that obtained through process (2) earlier and repeat processes (3-1) to (3-3)

